

REMARKS/ARGUMENTS

Reconsideration of the subject application in light of the following remarks and arguments is respectfully requested.

The claims pending in the subject application are directed to a voice coil actuator in which first and second magnets and a first soft magnetic pole piece are positioned along a common axis. A coil having a length less than the first soft magnetic pole piece is positioned to travel along the common axis. Also included is a structure that provides a magnetic path between the free ends of the magnets with respect to the first soft magnetic pole piece.

Such a structure, through the dimensioning of the first and second magnets, the first soft magnetic pole piece, and the ampere-turns through the coil, can provide a desired force versus stroke characteristic, such as one which can be viewed as having an "electromagnetic spring" constant.

Claims 1-6 and new claim 7 are pending in the subject application.

Claim Rejections

35 U.S.C. 112, second paragraph – claim 1:

The Examiner has rejected claim 1 under 35 U.S.C. 112, second paragraph, on the ground that the recited limitation "the lengths" lacks an antecedent basis. Claim 1 has been amended to substitute the word "length" for the word "lengths" to correct the above typographical error.

35 U.S.C. 103(a) – claims 1-6:

The Examiner has also rejected claims 1 to 6 under 35 U.S.C. 103(a) as obvious in view of Miyazaki EP 070314 ("Miyazaki"). As to claims 1, 2, 5 and 6, the thrust of the Examiner's position is that Miyazaki's Fig. 5 discloses the claimed structure except for the recited length of the coil, but that it would have been an obvious design choice to modify the length of the coil in Miyazaki, citing

In re Ross, 105 USPQ 237 (CCPA 1955) for the proposition that modifications involving a mere change in size are within the level of ordinary skill in the art.

For claim 4, the Examiner considered it an obvious design choice and mere change in size to modify Miyazaki to have a first magnet substantially twice the length of a second magnet.

Applicant respectfully traverses these rejections.

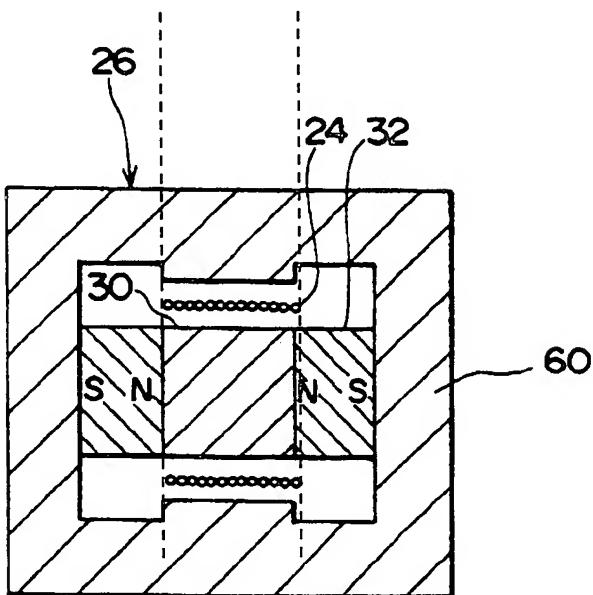
As Miyazaki is understood, it is respectfully submitted that Miyazaki's operational objective and purpose is so substantially different from that of the claimed invention, that one of skill in the art would not be motivated to modify Miyazaki's apparatus as asserted by the Examiner in his rejections of claims 1 to 6. Simply put, the asserted modifications are contrary to what Miyazaki is trying to achieve.

More specifically, it is understood that Miyazaki is directed to a vibration isolating apparatus and vibration isolating table which means that the stroke of Miyazaki's coil is very close to zero, and preferably zero. In paragraph (57) on the face page of Miyazaki, the apparatus is described as having an acceleration sensor that detects vibration on the vibration isolating table, and provides an acceleration detecting signal to a controlling device. The controlling device controls an electric current applied to a coil 24 such that vibration acting on the vibration isolating table becomes zero. Also, in col. 6, line 59, and col. 7, lines 18 and 23, the operation of the Miyazaki apparatus is described in the context of counter-acting vibrations which cause floor 14 to be slightly shifted. As described in col. 6, lines 32 to 46 of Miyazaki, the design and purpose of the coil and magnet structure of Miyazaki is to be controllable to counteract the movements of floor 14 such that any vibration acting on the vibration isolating table "becomes zero." Thus, it is respectfully submitted that the "vibration isolation" function of Miyazaki's requires that the magnetic flux crossing the coil be maximized in order to maximize the force which can be produced.

With the above context in mind, an examination of Miyazaki's Fig. 5, reproduced below (dashed lines added), confirms that the relative proportions

and lengths of coil 24, second member 30, and magnets 32 are consistent with vibration isolation.

F I G. 5



In particular, it can be seen from Miyazaki's Fig. 5 (and the dashed lines which have been added in red) that Miyazaki teaches a coil 24 having a length which is greater than the length of second member 30, and less than twice the length of magnet 32. This is consistent with the vibration isolation context of Miyazaki because a length of coil 24 which is greater than the length of second member 30 provides complete coverage of the second member 30 by coil 24 so that all of the flux from second member 30, and any fringe flux generated at the junctions of second member 30 and magnets 32, cross coil 24, thereby maximizing the magnetic flux crossing coil 24.

Further, the undersigned attorney has not found any discussion in Miyazaki that the length of coil 24 of Fig. 5 can be less than the length of second member 30; nor has any discussion been found that the relative lengths of coil 24, second member 30, and magnets 32 may or should be changed.

The Examiner's asserted modifications to Miyazaki in fact undermine the vibration isolation that Miyazaki is seeking to obtain. For example, making the length of coil 24 shorter relative to second member 30 will reduce the amount of flux crossing coil 24 thereby reducing, rather than maximizing, the available force. A reduction in force means a reduction in vibration isolation which is counter to what Miyazaki is attempting to achieve.

Thus, it is respectfully submitted that the Examiner is not only attempting to make a change where no change is contemplated by the reference, but is also making a change contrary to the goals and objectives of the reference.

It is therefore respectfully submitted that rather than being obvious to one of ordinary skill in the art, the Examiner's asserted modifications are instead the result of improper hindsight. Claims 1 to 6 are therefore patentable for at least the above reasons.

Further, claim 1, as amended, is patentable over Miyazaki because Miyazaki does not teach or suggest that "the lengths of the first and second magnets and the first soft magnetic pole piece are selected to provide a force versus stroke characteristic in which a force is provided which is greater at one end of a stroke of the voice coil actuator and decreases to a lowest level at an other end of the stroke." Support for the amendment to claim 1 can be found in Figs. 4 and 6, for example. As can be appreciated from Figs. 4 and 6 and page 4, lines 20-26 in the subject application, the force versus stroke characteristic of the claimed invention can be altered, as required by the particular usage of the actuator, by for example altering the lengths of the first and second permanent magnets and the pole piece. Thus, as exemplified in Figs. 4 and 6, and claimed in amended claim 1, a force versus stroke characteristic can be provided in which the force is greater at one end of the stroke and decreases to its lowest level at the other end of the stroke. It is respectfully submitted that such a characteristic is substantially different from Miyazaki's vibration isolation objective.

Claims 3 and 4 are patentable over Miyazaki as being dependent from allowable base claims.

Claim 4 is further patentable over Miyazaki because Miyazaki does not teach or suggest a “second soft magnetic pole piece positioned along the common axis at the free end of the first magnet and having a length no greater than the length of the first magnet, and a shell portion which extends from a point near the second soft magnetic pole pieces to the free end of the second magnet” as recited in claim 4. Further, claim 4 has been amended to delete the extraneous phrase “wherein the structure includes.”

Like claim 4, claim 6 recites a “second soft magnetic pole piece” and is for this reason further patentable over Miyazaki.

Further, claim 5 has been amended to recite that “the first soft magnetic pole piece has a length greater than two times a length of the first magnet or a length of the second magnet” and the length of the coil is “less than the length of the first or the second magnets.” Support for this amendment can be found in Figs. 3 and 5, for example. Thus, claim 5 is further patentable over Miyazaki because Miyazaki does not teach or suggest these features. From Miyazaki’s vibration isolation structure in Fig. 5, it can be seen that Miyazaki’s coil 24 is nearly twice the length of either of magnets 32, that Miyazaki’s second member 30 is less than twice the length of either of magnets 32, and that Miyazaki’s coil 24 covers more than the entirety of second member 30 – length relationships which are substantially different from those recited in amended claim 5.

Finally, new claim 7 has been added which depends from claim 2. New claim 7 recites that the “length of the coil is less than the length of the second magnet, the length of the first magnet is greater than the length of the second magnet, and the length of the first soft magnetic pole piece is approximately four times the length of the first magnet.” Support for this amendment can be found at page 5, lines 14-18 of the subject specification. It is respectfully submitted that Miyazaki neither teaches nor suggests such features.

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For the above reasons, it is respectfully submitted that claims 1-7 are now allowable, and the Examiner's indication to that end is respectfully solicited.

Respectfully submitted,

Gray Cary Ware & Freidenrich LLP

By: 
Gerald T. Sekimura
Reg. No. 30,103
Tel.: 415-836-2576

Attn.: Patent Department
Gray Cary Ware & Freidenrich LLP
153 Townsend Street, Suite 800
San Francisco, CA 94107-1922